

REMARKS

Reconsideration is requested.

In this response, claim 13 has been cancelled and new claims 57-60 have been added. Accordingly, claims 1, 3, 6-12, 14-30, and 57-60 are in the application for consideration.

In the Specification

The title of the present application has been corrected to be indicative of the invention to which the claims are directed. Paragraph [0040] of the present specification has been amended to correct a minor typographical error with respect to a reference numeral. No new matter is added.

In the Drawings

The attached sheets of drawings includes changes to Figures 8 and 10. The attached sheets, which include Figures 8 and 10, respectively, replaces the original sheets including Figures 8 and 10. In Figure 8, reference numeral 50 has been amended to read "51". In Figure 10, arrow of reference numeral 110 has been amended to correspond to what has been shown in Figure 9. No new matter is added by way of this amendment.

In the claims

Claims 1, 3, 11-18, and 25-26 stand rejected under 35 U.S.C. 102(b) as being anticipated by Sugiyama (U.S. Patent No. 5,999,675); and claims 1, 3, 6-12, and 16-30 stand rejected under 35 U.S.C. 102(e) as being anticipated by Beebe et al. (U.S. Patent No. 6,462,381).

Applicants respectfully traverse the rejection of claims 1, 3, 11-18, and 25-26 under 35 U.S.C. 102(b) as being anticipated by Sugiyama.

Under 35 U.S.C. §102, in order to “anticipate a claim, a prior art reference must show each and every element claimed.” *Leinoff v. Louis Milona & Sons, Inc.*, 726 F. 2d 734, 738, 220 USPQ 845, 848 (Fed. Cir. 1984). Putting it differently, “[l]acking an element of the claims, the reference cannot anticipate the claims under §102. *Carman Industries, Inc. V. Wahl*, 724 F. 2d 932, 937-938, 220 USPQ 481, 485 (Fed. Cir. 1983). Every element of the claimed invention must be literally present, arranged as in the claim. (cite omitted).

Amended claim 1 recites a method of forming semiconductor circuitry including providing a monocrystalline silicon substrate, forming a mask which covers a first portion of the substrate and leaves a second portion uncovered, forming a recess in the uncovered portion, after forming the recess, providing an insulative material spacer along a sidewall of the recess, at least partially filling the recess with a semiconductive material that comprises at least 1 atomic percent of an element other than silicon, the providing step being performed

before at least partially filling the recess..., removing the mask, forming a first semiconductor circuit component over the first portion of the substrate, and forming a second semiconductor circuit component over the semiconductive material that at least partially fills the recess.

The Office Action refers to Sugiyama's Figures 5 and 7B and asserts that it teaches all the elements of claim 1. More specifically, the Examiner asserts that Sugiyama teaches providing a monocrystalline substrate (3), forming a recess (16), at least partially filling the recess with semiconductor material (6), forming a first semiconductor circuit (1) over a first portion of the substrate, and forming a second semiconductor circuit (10) over the semiconductor material that at least partially fills the recess. Applicants respectfully disagree in view of the following:

Although the Examiner has not specifically cited to a mask formed to cover the first portion as recited in claim 1, Applicants assume that the Examiner is referring to film 8a (Sugiyama's Fig. 7C) in support thereof. With that understanding, Sugiyama's trench 16 is formed in the uncovered portion (e.g., portion that is not covered by silicon oxide film 8a), and the first portion of substrate 3 is covered by film 8a. Thus, the Examiner asserts Sugiyama teaches a silicon oxide film 8a is formed over a first portion of substrate 3, and film 8a is not formed over trench 16 (e.g., second portion) of substrate 3.

Amended claim 1 recites, in part, after forming the recess, providing an insulative material spacer along a sidewall of the recess. Sugiyama fails to teach or suggest this claim feature.

In Sugiyama, isolation layer 4 is formed in the silicon layer 3 prior to forming trench groove 16. Sugiyama discloses "silicon layer 3 is selectively etched ... to form a small trench groove 16 in the n-type silicon layer 3. On end portion of the trench groove 16 is bounded by one side of the silicon oxide isolation layer 4...." Isolation layer 4 of Sugiyama is thus provided before forming the trench 16. See Sugiyama's Figures 7A-7B and col. 5, lines 29-42.

In contrast, amended claim 1 recites after forming the recess, the insulative material spacer is provided along a sidewall of the recess. At least for this reason alone, claim 1 is patentably distinguishable over Sugiyama.

Claim 1 further recites removing the mask that is formed to cover a first portion of the substrate, forming a first semiconductor circuit component over the first portion of the substrate, and forming a second semiconductor circuit component over the semiconductive material that at least partially fills the recess. Sugiyama fails to teach or suggest such claim elements.

For example, Sugiyama fails to teach or suggest removing the mask (e.g., film 8a) that is formed to cover the first portion of substrate 3. Neither in Figure 5 nor in Figure 7B as cited by the Examiner, film 8a has been removed. It appears that the Examiner failed to recognize the presence of such step as recited in claim 1, and accordingly, Applicants note that examination of such

claimed step has not been done. Nevertheless, as noted above, Sugiyama fails to teach or suggest such step.

Furthermore, Sugiyama fails to teach or suggest forming a first semiconductive circuit component over the first portion of the substrate. Claim 1 further recites "forming a second semiconductor circuit component over the semiconductor material that at least partially fills the recess." The Examiner again refers to aluminum electrodes 10 in rejecting such feature of claim 1. How can aluminum electrode 10 be a first semiconductor circuit component as well as a second semiconductor circuit component? Sugiyama therefore fails to show each and every element of claim 1. In view of the above, claim 1 is neither anticipated nor rendered obvious over Sugiyama.

Applicants respectfully submit that claim 1 is allowable over Sugiyama.

As claims 3, 11-12, and 14-15 depend from claim 1, they too are allowable. For example, claim 11 further recites "the semiconductor material that at least partially fills the recess comprises Si and Ge, with the Ge being present to an atomic concentration of about 1% to about 20%." Sugiyama merely discloses that absorption layer 6 may be made of SiGe. Sugiyama fails to teach or suggest that Ge is present to an atomic concentration of about 1% to about 20% as recited in claim 11. Therefore, claim 11 is patentably distinct over Sugiyama. Claim 12 is also allowable at least for reasons similar to that set forth with reference to claim 11.

Amended claim 16 is allowable at least for reasons set forth as above with reference to claim 1 in addition to its own independent features. For example, claim 16 recites, in part, providing a substrate comprising a first monocrystalline material, an insulative layer over the first monocrystalline material, and a second monocrystalline material over the insulative layer and spaced from the first monocrystalline material by at least the insulative layer, the second monocrystalline material consisting essentially of a first element." Sugiyama fails to teach or suggest such a structure of claim 16.

Claim 16 further recites forming a mask to cover a first portion of the second monocrystalline material, while leaving a second portion uncovered. Sugiyama fails to teach or suggest such step. In Sugiyama, silicon oxide film 8a is formed on substrate 3. There is no teaching or suggestion that film 8a is formed to cover a first portion of the second monocrystalline material, while leaving a second portion uncovered.

Accordingly, claim 16 is patentably distinct over Sugiyama. Withdrawal of rejection of claim 16 is respectfully urged.

As claims 17-18, and 25-26 depend from claim 16, they too are allowable.

The Examiner erroneously notes that Beebe has common assignee with the present application.

Claims 1, 3, 6-12, and 16-30 were rejected under 35 U.S.C. §102(e) as being anticipated by Beebe. Applicants disagree in view of the following:

Bebee fails to teach or suggest, after forming the recess, providing an insulative material spacer along a sidewall of the recess, the providing step being performed before at least partially filling the recess with the semiconductive material, wherein the at least partially filling the recess with the semiconductive material comprises providing the semiconductive material along the insulative material spacer, as recited in amended claim 1.

Since Bebee fails to identically teach each and every element of claim 1, there can be no anticipation of claim 1 under 35 U.S.C. §102(e). Accordingly, claim 1 is patentably distinct over Bebee. Further, claim 1 would not be obvious over a combination of Sugiyama and Bebee as Sugiyama fails to cure Bebee's deficiencies in addition to other deficiencies as described above with reference to patentability of claim 1 over Sugiyama. Withdrawal of rejection of claim 1 over Bebee is respectfully urged.

As claims 3, and 6-12 depend from claim 1, they too are allowable. For example, claim 7 further recites that the semiconductive material that at least partially fills the recess comprises silicon and at least 1% carbon. Bebee's col. 4, lines 25-41 fail to teach or suggest such. Carbon is neither disclosed nor suggested in such disclosed portions of Bebee's specification. Accordingly, claim 7 is patentably distinct over Bebee. Claims 8-9 are also patentably distinct over Bebee for similar reasons.

Claim 16 is patentably distinct over Bebee at least for reasons set forth above with respect to claim 1 in addition to its own independent features. Withdrawal of rejection of claim 16 is respectfully urged.

As claims 17-30 depend from claim 16, they too are allowable. For example, claim 19 further recites "wherein the mask comprises a layer consisting essentially of silicon nitride over a layer consisting essentially of silicon dioxide." Bebee fails to teach or suggest such a feature. Bebee's col. 5, lines 65-67 merely disclose a mask formed over SOI material. Bebee fails to teach or suggest that the mask comprises a layer consisting essentially of silicon nitride over a layer consisting of silicon dioxide as in claim 19. Accordingly, claim 19 is patentably distinct over Bebee. Withdrawal of rejection of claim 19 is respectfully urged.

Claim 20 recites "the semiconductive material that at least partially fills the recess comprises silicon and at least 1% carbon." Col. 4, lines 25-41 of Bebee disclose a listing of alternative materials that could be used to fill the backside contact opening. Bebee's such listing fails to teach or suggest that the semiconductive material includes at least 1% carbon as required by claim 20. Accordingly, claim 20 is patentably distinct over Bebee. Withdrawal of rejection of claim 20 is respectfully requested.

Claim 28 further recites "the anneal comprises maintaining the semiconductive material at a temperature of from about 800°C to about 1100°C for a time of from about 20 seconds to about 5 minutes, and exposing the

semiconductive material to laser light having a wavelength which interacts with one or more components of the semiconductive material.” Bebee fails to teach or suggest such feature as in claim 28.

Claim 29 further recites chemical-mechanical polishing the semiconductive material to form a planarized surface which extends across the semiconductive material and mask, after the chemical-mechanical polishing, exposing the semiconductive material to a laser to anneal the Si and Ge of the semiconductive material, and the removing the mask occurring after the anneal. Bebee’s col. 4, lines 25-41 fails to teach or suggest such features of claim 29. In fact, the cited portions of Bebee’s specification are not even remotely relevant to the features of claim 29. Claim 30 more specifically recites “after the removal of the mask, the semiconductive material extends above an uppermost surface of the first portion of the second monocrystalline substrate by a distance of from about 50Å to about 200Å.” Bebee fails to teach or suggest such feature of claim 30.

For all the reasons advanced above, claims 17-30 depending from claim 16 are in condition for allowance. A notice to that effect is respectfully urged.

In this response new claims 57-60 are added. Support to such new claims may be found at least at Figures 4, 5, 6, and paragraph 30 on page 8, and paragraphs 31-34 on pages 9-10 of the specification as originally filed. No new matter is added by way of this amendment.

New claims 57-60 include subject matter that is neither taught nor suggested by Sugiyama or Bebee. For example, claim 57 includes subject matter of claims 6 and 13. Such subject matter is neither taught nor suggested by Sugiyama or Bebee. Likewise, claim 58 includes subject matter of claim 7 and 13. Accordingly, claims 57-58 are believed to be in condition for allowance.

New claim 59 recites, in part, forming a second semiconductor circuit component, that is different from the first semiconductor device component, over the semiconductive material that at least partially fills the recess, wherein the first semiconductor device is incorporated into a DRAM array, and the second semiconductor device is incorporated into logic circuitry corresponding to a portion of circuitry formed peripheral to the DRAM array. Neither Sugiyama nor Bebee teaches or suggest such feature. Accordingly, claim 59 is believed allowable.

New claim 60 recites, in part, forming a second semiconductor circuit component over the semiconductive material that at least partially fills the recess, wherein the semiconductive material comprises silicon and at least 1% carbon. Neither Sugiyama nor Bebee teach or suggest such a feature. Accordingly, claim 60 is believed to be in condition for allowance.

CONCLUSION

This application is believed to be in immediate condition for allowance, and action to that end is requested. If the Examiner's next anticipated action is

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to be anything other than a Notice of Allowance, the undersigned respectfully requests a telephone interview prior to issuance of any such subsequent action.

Respectfully submitted,

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